CLAIMS

1. A jet drive for an amphibious vehicle comprising:

a fluid inlet;

a fluid outlet;

a conduit extending from the fluid inlet to the fluid outlet and defining a fluid flow path therebetween; and

a rotatable impeller housed within the conduit between the fluid inlet and fluid outlet, wherein:

the ratio of thrust to intake length of the jet drive is at least 18,000 Newtons per metre.

2. A jet drive as claimed in claim 1 wherein the ratio of the thrust to the overall length of the jet drive is at least 8,000 Newtons per metre.

3. A jet drive as claimed in claim 1 or claim 2 wherein the ratio of the overall length of the jet drive to the intake length is between 2.01 and 2.11.

4. A jet drive as claimed in any one of the preceding claims wherein the ratio of the jet overall length to the engine power is less than 7 millimetres per kilowatt.

5. A jet drive as claimed in any one of the preceding claims wherein the ratio of the thrust to the impeller diameter is at least 25000 Newtons per metre.

6. A jet drive as claimed in any one of the preceding claims wherein the ratio of the jet nozzle diameter to the engine power is at least 1.3 millimetres per kilowatt.

7. A jet drive as claimed in any one of the preceding claims wherein the ratio of the jet nozzle diameter to the impeller diameter is at least 0.6.

8. A jet drive as claimed in any one of the preceding claims wherein the ratio of the jet nozzle diameter to the overall length of the jet drive is at least 0.21.

9. A jet drive as claimed in any one of the preceding claims wherein the ratio of fluid inlet area to fluid outlet area is in the range 2.5 to 3.5.

10. A jet drive as claimed in any one of the preceding claims wherein the ratio of fluid inlet area to fluid outlet area is in the range 2.8 to 3.2.

11. A jet drive as claimed in any one of the preceding claims wherein the ratio of fluid inlet area to fluid outlet area is substantially 3.03.

12. A jet drive as claimed in any one of the preceding claims wherein the fluid inlet area is in the range $0.020m^2$ to $0.400m^2$, and the fluid outlet area is in the range $0.010m^2$ to $0.150m^2$.

13. A jet drive as claimed in any one of the preceding claims wherein the fluid inlet area is in the range $0.040m^2$ to $0.150m^2$, and the fluid outlet area is in the range $0.020m^2$ to $0.060m^2$.

14. A jet drive as claimed in any one of the preceding claims wherein the fluid inlet area is substantially $0.081m^2$, and the fluid outlet area is substantially $0.027m^2$.

15. A jet drive as claimed in any one of the preceding claims wherein the rate of fluid flow through the jet drive is in the range $0m^3s^{-1}$ to $1.5m^3s^{-1}$.

16. A jet drive as claimed in any one of the preceding claims wherein the rate of fluid flow through the jet drive varies from substantially $0.2m^3s^{-1}$ when the impeller is driven at 600rpm to substantially $1.1m^3s^{-1}$ when the impeller is driven at 3000rpm.

17. A jet drive as claimed in any one of the preceding claims further comprising a stator housed within the conduit between the impeller and the fluid outlet.

18. A jet drive as claimed in claim 18 wherein the stator has

an inlet diameter in the range of 0.11m to 0.66m.

19. A jet drive as claimed in claim 18 or claim 19 wherein the stator has an inlet diameter in the range of 0.25m to 0.35m.

20. A jet drive as claimed in any one of claims 17 to 19 wherein the stator has an inlet diameter of substantially 0.305m.

21. An amphibious vehicle comprising a jet drive as claimed in any of the preceding claims wherein the ratio of thrust to engine power is at least 0.05 Newtons per Watt.

22. An amphibious vehicle comprising a jet drive as claimed in any one of claims 1 to 20 or an amphibious vehicle as claimed in claim 21 wherein the jet drive generates a peak bollard pull of at least 7kN from an engine peak power of less than 135kW, within a jet overall length of less than 860mm.

23. An amphibious vehicle as claimed in claim 22 wherein the peak bollard pull is at least 7.7kN.

24. An amphibious vehicle comprising a jet drive as claimed in any one of claims 1 to 20 or an amphibious vehicle as claimed in any one of claims 21 to 23 wherein the impeller can be driven in an opposite direction to that required for forward motion of the vehicle to effect a braking or a reversing function.

25. An amphibious vehicle comprising a jet drive as claimed in any one of claims 1 to 20 or an amphibious vehicle as claimed in any one of claims 21 to 24 further comprising a drive shaft linking a power take off of an engine to a jet input of the jet drive, wherein the drive shaft is skewed horizontally and/or vertically relative to the longitudinal axis of the vehicle.

26. An amphibious vehicle as claimed in claim 25 further comprising at least one universal joint affixed to the drive shaft.

27. An amphibious vehicle as claimed in claim 25 or claim 26 further comprising at least one constant velocity joint affixed to the drive shaft.

28. An amphibious vehicle as claimed in any one of claims 24 to 27 which is fully contained within the amphibious vehicle such that no part of the jet drive extends out of the vehicle.

29. A jet drive for an amphibious vehicle comprising:

a fluid inlet;

a fluid outlet;

a conduit extending from the fluid inlet to the fluid outlet and defining a fluid flow path therebetween; and

a rotatable impeller housed within an impeller housing in the conduit between the fluid inlet and fluid outlet, wherein:

the ratio of the axial length of the conduit to the mean internal diameter of the impeller housing is less than 4.0.

30. A jet drive as claimed in claim 29 wherein the ratio of the axial length of the conduit to the mean internal diameter of the impeller housing is less than 3.2.

31. A jet drive as claimed in claim 29 or claim 30 wherein the ratio of the axial length of the conduit to the mean internal diameter of the impeller housing is substantially 2.9.

32. A jet drive as claimed in any one of claims 29 to 31 wherein the axial length of the conduit is in the range 0.3m to 2.0m, and the mean internal diameter of the impeller housing is in the range 0.1m to 0.66m.

33. A jet drive as claimed in any one of claims 29 to 32 wherein the axial length of the conduit is in the range 0.7m to 1.0m and the mean internal diameter of the impeller housing is in the range 0.25m to 0.33m.

34. A jet drive as claimed in any one of claims 29 to 33 wherein the axial length of the conduit is substantially 0.85m and the mean internal diameter of the impeller housing is

substantially 0.295m.

35. Use of a jet drive as claimed in any one of claims 1 to 20 or claims 29 to 34 to propel an amphibious vehicle operating in marine mode.

36. Use of a jet drive as claimed in any one of claims 1 to 20 or claims 29 to 34 to propel an amphibious vehicle operating in marine mode to a speed where sufficient hydrodynamic lift is achieved for the vehicle to plane.

37. Use of a jet drive as claimed in any one of claims 1 to 20 or claims 29 to 34 to propel an amphibious vehicle having a through water drag co-efficient greater than 0.27 at a speed of 8.7 knots ($4.5ms^{-1}$) and a trim angle between ten and fifteen degrees, the jet drive propelling the vehicle when operating in marine mode to a speed where sufficient hydrodynamic lift is achieved for the vehicle to plane.

38. An amphibious vehicle incorporating the jet drive as claimed in any one of claims 1 to 20 or claims 29 to 34.

39. A jet drive substantially as hereinbefore described with reference to or as shown in Figures 2 and 3 of the accompanying drawings.

40. Use of a jet drive substantially as hereinbefore described with reference to or as shown in Figures 2 and 3 of the accompanying drawings.

41. An amphibious vehicle incorporating a jet drive substantially as hereinbefore described with reference to or as shown in Figures 2 and 3 of the accompanying drawings.